Insights Gained From the Development of an Integrated Non-native Invasive Plant Management Plan at Fort A.P. Hill, Virginia.

Matthew Hohmann, Tim Southard, Jason Applegate, and Terry Banks

August 2002

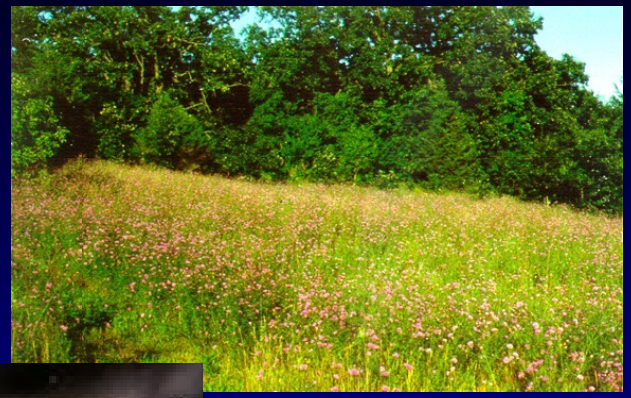
US Army Corps of Engineers

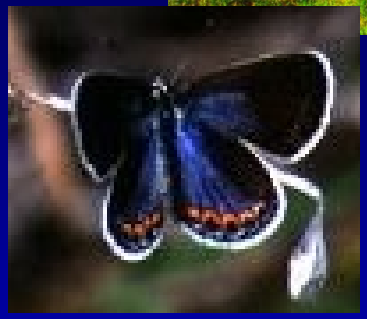
Engineer Research and Development Center

Background

- Non-native Invasive Plant Species (NIPS) pose a significant challenge for natural resources management on Army installations.

- NIPS cause loss of biodiversity, increased soil erosion, damage to culturally significant resources, reduced returns from forestry, hunting and agricultural out-lease programs, and degradation of threatened and endangered species habitat





Problem

- Moreover, NIPS can negatively impact military operations, troop deployment, troop safety, training land use, military carry capacity, and the long-term sustainability of training lands.

Laws, Regulations, and Guidance That Direct NIPS Control and Management on Army Installations

- Executive Order 13112 - Invasive Species (1999)
- Army Policy Guidance for the Management and Control of Invasive Species (2001)
- Federal Noxious Weed Act of 1974 as amended
- Plant Protection Act of 2000
- DoD Transportation Regulation
- Endangered Species Act
- NEPA
- Clean Water Act
- Clean Air Act
- Army Regulation 200-3
- State laws

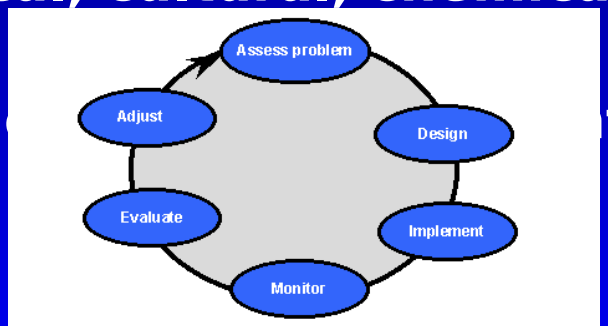
Goals of the Fort A.P. Hill Integrated NIPS Management Plan

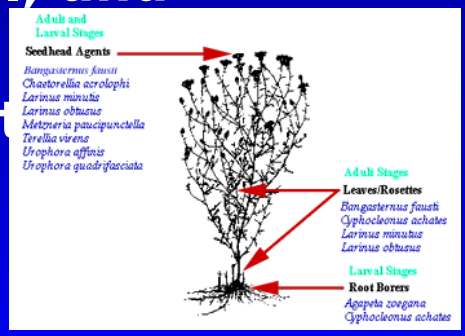
1. Provide a comprehensive plan for managing NIPS on Fort A.P. Hill in a manner that is consistent with Army and Federal environmental regulations and that supports the installation's military mission.
2. Help ensure that NIPS management is implemented in the most effective and cost efficient manner.
3. Ensure that NIPS management is consistent with the installation INRMP.

Approach to NIPS Management

- Based on a strategy of education, prevention, early detection, control, monitoring, and assessment.
  - advocates proactive management of NIPS, which is the most effective and cost efficient means of NIPS control
  - NIPS control methods are based on the concept of Integrated Weed Management (IWM)

biological, cultural, chemical, and





Approach

Steps taken in the development of the Fort A.P. Hill Integrated NIPS Management Plan:

1. Identify land management units and develop land management goals
2. Assess the extent to which NIPS occur within land management areas
3. Develop NIPS management objectives
4. Determine what NIPS management actions necessary to meet objectives
5. Develop recommendations for monitoring and assessment

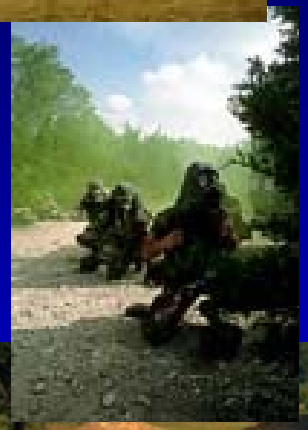
Land Use and Management

Land Use

- Military Training Use
- Multiple use
  - Forestry
  - Agricultural out-lease
  - Recreation

Land Management

- ITAM
- Natural Resource management programs



Land Use and Land Management Units

- Forests (unharvested, harvested, and plantation)
- Ag. out-lease lands
- Training ranges
- Training facilities
- Bivouacs
- Campsites
- Cultural resource sites
- Wetlands (riparian, pond, lake)
- T&E Plant Sites
- T&E Bird Sites
- Wildlife Food plots
- Power line
- Vegetative corridor
- Impact Area
- Controlled Access Areas

Land Management Goals

- **Threatened Plant Sites:**
  - **Maintain viable populations of threatened plant species**
  - **Increase stem counts by 25% at sites with fewer than 20 individuals.**
  - **Restore degraded habitats and reestablish species in historic locations.**

Isotria medeoloides

Helonias bullata

NIPS on Fort A.P. Hill

- Information on NIPS diversity is available from several sources including: the FAPH plant list/herbarium, a grassland survey, E&NRD staff observations, and a NIPS survey.
- However information on NIPS distribution and abundance is limited to the 2001 survey.
- Species targeted in the survey were based on the Virginia Department of Conservation and Recreation, Division of Natural Heritage, Invasive Alien Plant List, which ranks species according to invasiveness and impact on native plant communities.
- Abundance data were collected for 32 A-ranked species and the presence of B- and C-ranked species was noted.

NIPS on Fort A.P. Hill

Survey Design

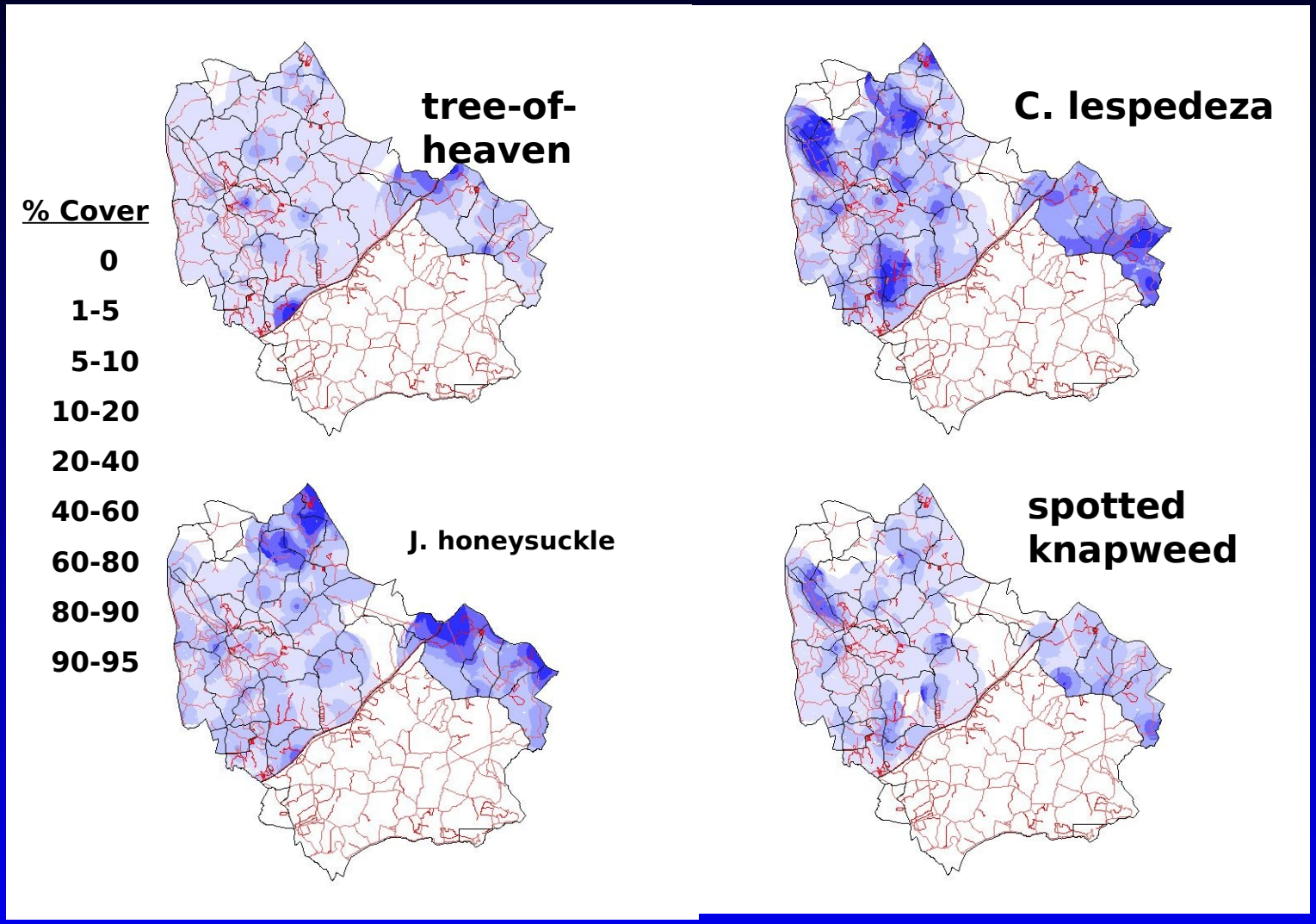
- Random - systematic plot allocation, stratified by land management type.
- Land management types (21) were prioritized and assigned a sampling intensity according to priority.
- Sampling intensity was set to attain at least a 2% inventory in high priority areas and a 1% inventory in lower priority areas.
- Abundance data collected as percent cover within 25 m x 50 m plots (0.125 hectare).
- Nearly 900 plots in 17 of 31 TA were sampled, covering 12,873 hectares (31,810 acres).

NIPS on Fort A.P. Hill

- Of the 32 A-ranked NIPS targeted, 12 A-ranked NIPS were documented by the survey.

Species	# plots	% of plots
Chinese lespedeza	357	40%
Japanese honeysuckle	331	37%
spotted knapweed	168	19%
autumn olive	164	18%
tree-of-heaven	101	11%
wineberry	29	3%
Chinese privet	7	1%
johnson grass	6	1%
multiflora rose	6	1%
aneilima	3	<1%
common reed	1	<1%
kudzu	1	<1%

NIPS on Fort A.P. Hill



NIPS on Fort A.P. Hill

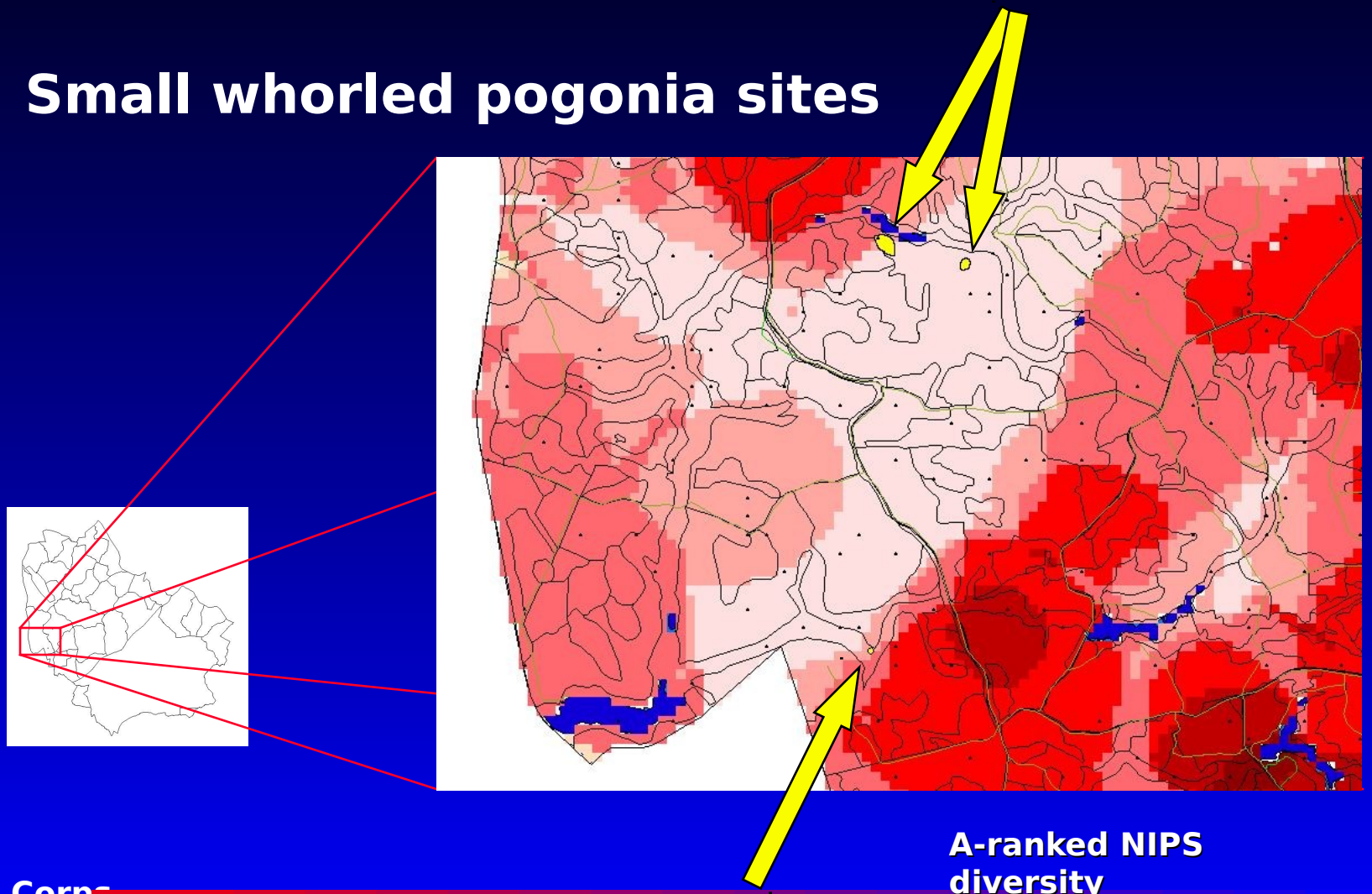
Species	Common Name	Record*	Invasive Ranking†
Trees			
Ailanthus altissima	tree-of-heaven	1, 3	A
Acer platanoides	Norway maple	4	B
Quercus acutissima	sawtooth oak	3	C
Albizia julibrissin	mimosa	3	C
Vines			
Lonicera japonica	Japanese honeysuckle	1, 3	A
Pueraria lobata (P. montana)	kudzu vine	1, 3	A
Wisteria sinensis	Japanese wisteria	3	B
Hedera helix	English ivy	1	B
Vinca minor	vinca	1, 3	C
Shrubs			
Elaeagnus umbellata	Autumn olive	1, 3	A
Euonymus alatus	winged burning bush	4	A
Ligustrum sinense	Chinese privet	1, 3	A
Lonicera maackii	shrub honeysuckles	2	A
L. morrowii			
L. standishii			
L. tatarica			
Rosa multiflora	multiflora rose	1, 3	A
Rubus phoenicolasius	wineberry	1	A
Berberis thunbergii	Japanese barberry	1	B
Spirea japonica	Japanese spirea	4	B

NIPS on Fort A.P. Hill (continued)

Species	Common Name	Record*	Invasive Ranking†
Herbaceus Plants			
Centaurea maculosa	spotted knapweed	1, 3	A
Cirsium arvense	Canada thistle	2	A
Murdannia keisak	aneilima	1, 3	A
Lespedeza cuneata	Chinese lespedeza	1, 3	A
Phragmites australis	common reed	1, 3	A
Polygonum cuspidatam	Japanese knotweed	2	A
Sorghum halapense	johnson-grass	1	A
Carduus nutans	nodding thistle	1, 3	B
Convovulus arvensis	field-bindweed	1	B
Coronilla varia	crown vetch	1, 3	B
Festuca elatior	tall fescue	4	B
Ipomoea hedearacea	ivy-leaved morning-glory	3	B
Lespedeza bicolor	shrubby bushclover	3	B
Rumex crispus	curled dock	1, 3	B
Stellaria media	common chickweed	1, 3	B
Setaria faberi	giant foxtail	3	B
Xanthium strumarium	common cocklebur	1	B
Albizia julibrissin	mimosa	1, 3	C
Dactylis glomerata	orchard grass	3	C
Ipomoea coccinea	red morning-glory	3	C
Perilla frutescens	beefsteak plant	3	C

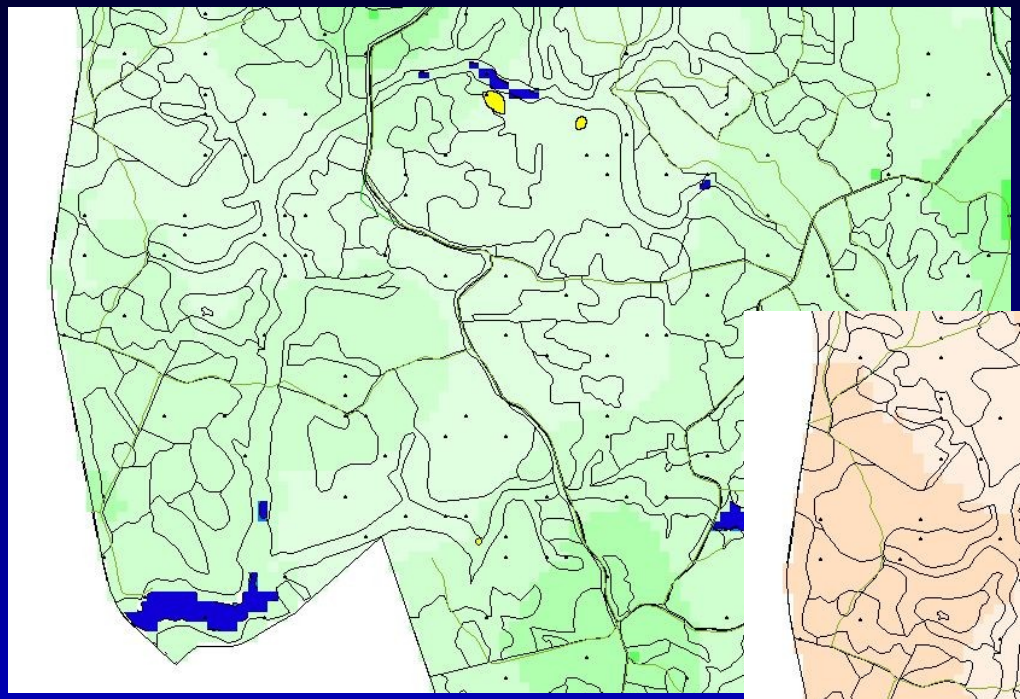
NIPS on Fort A.P. Hill

- Small whorled pogonia sites



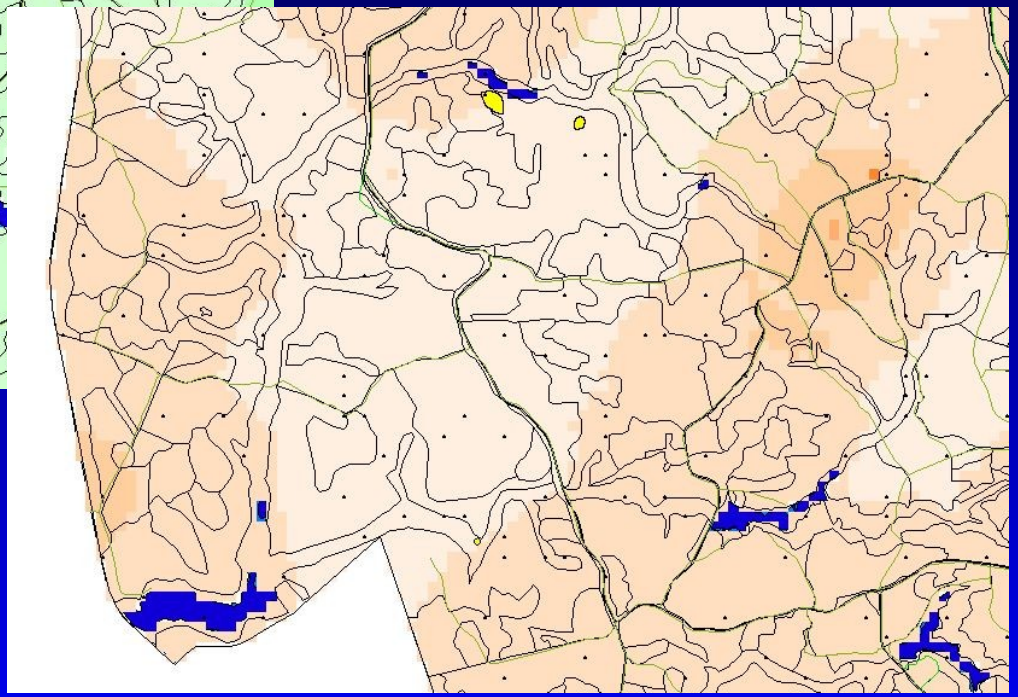
A-ranked NIPS diversity

NIPS on Fort A.P. Hill



C. lespedeza

J. honeysuckle



NIPS Management Objectives

General:

- **Based on land management goals, as well as NIPS distribution and abundance.**
- **Management Objectives:**

Eradication
Containment
Suppression
Prevention

Cost

NIPS Management Objectives

Small whorled pogonia sites:

- **Over the next 5 years, eradicite all A- and B-ranked NIPS within a 100 m buffer surrounding extant and historic small whorled pogonia sites.**
- **Prevent the introduction of all A- and B-ranked NIPS to pogonia sites and within a 100 m buffer.**

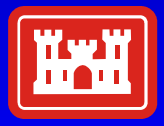
Potential invaders:

Chinese privet	autumn olive	Japanese knotweed
tree-of-heaven	shrub honeysuckles	johnson grass
multiflora rose	Japanese barberry	Japanese spirea
wineberry	winged burning-bush	kudzu

NIPS Management Actions

General:

- Prevention: use weed free hay/mulch, require vehicle/ equipment wash downs, limit disturbance, limit entrance at critical times
- Early detection: educate, implement a reporting system, and conduct regular monitoring
- Control: IWM, prioritize, prevent, contain, suppress eradicate
- Monitoring and evaluation: critical element of adaptive management, necessary for follow control
- Education: develop field flash cards, educate natural resources staff and the public



NIPS Management Actions

Control of C. lespedeza and J. honeysuckle at small whorled pogonia sites:

- Prevention – few options available
- Early detection – regularly inventory sites for NIPS
- Control
  - Biocontrol – none available
  - Chemical - spot spray herbicides during mid-summer before seed set
  - Mechanical - hand pull
  - Cultural – limit forest fragmentation
- Monitoring and evaluation - assess control success and c conduct follow-up control on an annual basis.
- Education - few options available

Insights Gained

- 108 NIPS are found in Piedmont/Coastal Plain of Virginia.
- 34% (37) of these have been documented on FAPH
  - 43% (16) = A-ranked NIPS
  - 40% (15) = B-ranked NIPS
  - 16% (6) = C-ranked NIPS

- How does local NIPS diversity on FAPH compare with regional diversity? What does the future hold, barring prevention and control?
  - 50% of A-ranked NIPS (32)
  - 28% of B-ranked NIPS (54)
  - 24% of C-ranked NIPS (25)

Source of NIPS on Fort A.P. Hill

Species	Common Name	Record*	Invasive Ranking†
Trees			
Ailanthus altissima	tree-of-heaven	1	A
Quercus acutissima	sawtooth oak	1, 3	C
Albizia julibrissin	mimosa	1, 3	C
Vines			
Lonicera japonica	Japanese honeysuckle	1,	A
Pueraria lobata (P. montana)	kudzu vine	1,	A
Wisteria sinensis	Chinese wisteria	3	B
Hedera helix	English ivy	1	B
Vinca minor	vinca	1, 3	C
Shrubs			
Elaeagnus umbellata	autumn olive	1, 3	A
Ligustrum sinense	Chinese privet	1, 3	A
Lonicera maackii	shrub honeysuckles	2	A
L. morrowii			
L. standishii			
L. tatarica			
Rosa multiflora	multiflora rose	1, 3	A
Rubus phoenicolasius	wineberry	1,	A
Berberis thunbergii	Japanese barberry	1	B

Source of NIPS on Fort A.P. Hill

Species	Common Name	Record*	Invasive Ranking†
Herbaceus Plants			
Cirsium arvense	Canada thistle	2	A
Murdannia keisak	aneilima	1, 3	A
Lespedeza cuneata	Chinese lespedeza	1, 3	A
Phragmites australis	common reed	1, 3	A
Polygonum cuspidatam	Japanese knotweed	2	A
Sorghum halapense	johnson-grass	1,	A
Centaurea maculosa	spotted knapweed	1, 3	A
Coronilla varia	crown vetch	1, 3	B
Convovulus arvensis	field-bindweed	1	B
Carduus nutans	nodding thistle	1, 3	B
Lespedeza bicolor	shrubby bushclover	3	B
Festuca elatior	tall fescue	B	
Rumex crispus	curled dock	1, 3	B
Stellaria media	common chickweed	1, 3	B
Setaria faberi	giant foxtail	3	B
Ipomoea hedearacea	ivy-leaved morning-glory	3	B
Xanthium strumarium	common cocklebur	1	B
Dactylis glomerata	orchard grass	3	C
Ipomoea coccinea	red morning-glory	3	C
Perilla frutescens	beefsteak plant	3	C

Potential Impacts of NIPS

Common Name	Invasive Ranking	Training	Ag	Forestry	Hunting/Fishing
Trees					
tree-of-heaven	A	X		X	X
Norway maple	B	x	X		
sawtooth oak	C				
mimosa	C				
Vines					
Japanese honeysuckle	A	x	X		
kudzu vine	A	x	X		
Japanese wisteria	B	X			
English ivy	B				
vinca	C				
Shrubs					
autumn olive	A	X			
winged burning bush	A	X			
Chinese privet	A	X	X		
shrub honeysuckles	A	X	X	X	
multiflora rose	A	X	X		
wineberry	A				
Japanese barberry	B	X		X	
Herbaceus Plants					
Canada thistle	A	X	X		
aneilima	A				

Potential Impacts of NIPS

Common Name	Invasive Ranking	Training	Ag	Forestry	Hunting/Fishing
Herbaceus Plants					
Canada thistle	A		X		X
aneilima	A				
Chinese lespedeza	A		X		X
common reed	A		X		X
Japanese knotweed	A				
johnson-grass	A		X		X
spotted knapweed	A		X		X
crown vetch	B	X			
field-bindweed	B		X		X
nodding thistle	B		X		X
shrubby bushclover	B		X		X
tall fescue	B		X		X
curled dock	B		X		X
common chickweed	B		X		X
giant foxtail	B		X		X
ivy-leaved morning-glory		B			X
common cocklebur	B			X	X
orchard grass	C				X
red morning-glory	C	X			
beefsteak plant	C	X			

Conclusions

- Several NIPS are widely distributed and abundant on FAPH, but many are in the early stages of invading.
- NIPS have to potential to impact military land use, but effects will not be immediate in all cases.
- Local NIPS diversity is approximately a third of the regional diversity.
- Development of the FAPH Integrated NIPS Management Plan offers numerous benefits:
  1. Helps prioritize and budget NIPS control actions
  2. Ensures integration with installation INRMP
  3. Promotes proactive management